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PART II:

DEPARTMENT OF THE INTERIOR

Mining Enforcement and Safety Administration

■

UNDERGROUND COAL MINES

Illumination Requirements

Title 30—Mineral Resources

CHAPTER I—MINING ENFORCEMENT AND SAFETY ADMINISTRATION, DEPARTMENT OF THE INTERIOR

SUBCHAPTER O—COAL MINE HEALTH AND SAFETY

PART 75—MANDATORY SAFETY STANDARDS—UNDERGROUND COAL MINES

Illumination in Underground Coal Mines

Background. Section 317(e) of the Federal Coal Mine Health and Safety Act of 1969, as amended (83 Stat. 788; 30 U.S.C. 877(e)) directed the Secretary of the Interior within nine months after March 30, 1970, to propose standards under which all working places in a mine shall be illuminated by permissible lighting while persons are working in such places. Section 317(e) further provides that such working places shall be illuminated within eighteen months after such standards are promulgated.

Pursuant to authority under section 101 of the Act (30 U.S.C. 811) and in accordance with section 317(e), there was published in the FEDERAL REGISTER for December 31, 1970 (35 FR 20009) a notice of proposed rulemaking which prescribed the illumination to be provided in the working places of underground coal mines, and in addition, the reflection efficiency of the surfaces on permissible electric face equipment and restrictions on visual impedance and pulsation frequencies of lighting devices installed on such equipment.

In light of written comments, suggestions, and objections submitted to the Director, Bureau of Mines, concerning this notice of proposed standards, and in view of numerous consultation meetings held, in accordance with section 101(c) of the Act, subsequent to the publication of the proposed standards, it was deemed advisable to withdraw the proposed rulemaking of December 31, 1970, and to propose revised illumination standards.

Therefore, pursuant to the authority vested in the Secretary of the Interior under section 101(a) of the Act, and in accordance with section 317(e), there was published in the FEDERAL REGISTER for Wednesday, October 27, 1971, (36 FR 20607) proposed standards contained in § 75.1719 and §§ 75.1719–1 through 75.1719–4 of Part 75, Title 30, Code of Federal Regulations, setting forth proposed mandatory standards which would: (1) Prescribe the illumination to be provided in the working places of underground coal mines; (2) specify requirements for lighting fixtures; (3) provide for methods of measuring light; and (4) specify requirements for mining machines, hard hats, and cap lamps. Interested persons were afforded a period of 45 days within which to submit written comments, suggestions, or objections to the Director, Bureau of Mines.

Written comments, suggestions, and objections stating the grounds for objection and requesting a public hearing on the proposed standards were timely filed with the Director. In accordance with section 101(f) of the Act, a notice of objections filed and hearing requested was published in the FEDERAL REGISTER for Tuesday, February 19, 1974 (39 FR 6118).

Subsequently there was published in the FEDERAL REGISTER for Wednesday, March 6, 1974 (39 FR 8618) a notice of public hearing to be held for the purpose of receiving relevant evidence on the issues raised by the written objections and the grounds for such objections which had been filed in response to the proposed standards published on October 27, 1971 (36 FR 20607). The public hearing was held on April 4, 1974, in the Main Auditorium of the Department of the Interior. The record was held open for twenty-one days to permit submission of additional data and information. A verbatim transcript of the hearing, together with the comments, suggestions, information and data submitted, is available for public inspection in the Office of the Assistant Administrator, Coal Mine Health and Safety, MESA, Department of the Interior, Room 818, 4015 Wilson Boulevard, Arlington, Virginia 22203.

Based on the evidence in written comments, suggestions, data, and information submitted in response to the proposed rulemaking and at the public hearing, findings of fact were made public on June 25, 1974, and were published in the FEDERAL REGISTER for Friday, June 28, 1974 (39 FR 24021).

All comments, suggestions, statements, data, information, and objections submitted in response to the notice of proposed rulemaking of October 27, 1971 (36 FR 20607) and the public hearing have been fully and carefully considered. Modifications of the proposed standards have been made which are described below and in the findings of fact.

1. *Section 75.1719:* As proposed, § 75.1719 merely restated the provisions of section 317(e) of the Act. § 75.1719 has been revised to specifically state the date upon which the standards contained in §§ 75.1719–1 through 75.1719–4 were promulgated in the FEDERAL REGISTER and, without the necessity of referring to other sources when published in the Code of Federal Regulations, to provide and specifically state the date 18 months after promulgation by which mine operators shall provide the required lighting.

2. *Section 75.1719–1:* The proposed § 75.1719–1 has been revised and modified to reflect certain findings of fact and comments and suggestions received in response to the notice of proposed rule making. The major revisions concern the requirement for lighting only while self-propelled mining equipment is operated in a working place; a definition of "self-propelled mining equipment" for the purposes of these standards; a clearer description of the illumination required according to specific types of equipment; and rearrangement and redesignation of proposed provisions for clarity. The revisions, modifications and new provisions are further described below.

Section 75.1719–1(a): As proposed, paragraph (a) required each working place to be illuminated at all times while miners were working in such places. Paragraph (a) has been modified to require illumination of working places only while self-propelled mining equipment is operated in the working place. As stated in the June 25, 1974 findings of fact, this change is made because portable task luminaires or area lighting systems for various nonmachine underground operations (for example, timbering, electrical, pipe, or machine repair) would require frequent repositioning which in many cases increases the miner's exposure to electrical shock, ignition, and other hazards present in working places. Additionally, MESA reports show that almost all serious and fatal accidents in working places occur while self-propelled equipment is operated in such working places. Therefore, illumination of working places while self-propelled mining equipment is not operated in working places will not be required, and such requirements are deleted, pending further study and until further notice is given pursuant to section 101 of the Act. As a result of the modification, the majority of light fixtures can be installed on machines, thereby eliminating the need for the presence of additional miners in working places.

Section 75.1719–1(b): A new paragraph (b) has been added defining "self-propelled mining equipment" for the purpose of clarifying the kinds of equipment which would require that illumination be provided in specified areas of the working place while such equipment is operated in the working place.

Section 75.1719–1 (c) and (d): Proposed paragraphs (b) and (c) have been redesignated paragraphs (c) and (d) respectively.

Section 75.1719–1(e): Proposed paragraphs (d), (e), (f) and (g) of § 75.1719–1 have been revised, modified, rearranged or deleted to more clearly define the areas to be illuminated for specific types of equipment or to conform to findings of fact and have been combined into a new paragraph (e).

Proposed paragraph (e) of § 75.1719–1 required the gob-side of the longwall roof support system to be illuminated. Such a requirement would necessitate installation of light fixtures under unsupported roof which would be extremely hazardous to miners. Proposed paragraph (e) has been redesignated paragraph (e)(4), and since miners do not work or travel on the gob-side of the roof support system, the area required to be illuminated has been changed to include only the area in which miners travel and work, which is the area between the gob-side of the travelway and the side of the block of coal from which coal is being extracted.

In addition the control station, the head and tail piece, and the roof and floor for a distance of 5 feet horizontally from the control station, head piece, and tail piece shall be illuminated. Because of the similarity in the methods of mining, the areas to be illuminated in a shortwall working place have been included.

Paragraph (e)(2) has been added to cover the use of self-loading haulage equipment, such as scoops, when used to load materials in the working place. Such equipment is often used to load coal, rock, and other materials into shuttle cars and other types of haulage cars, and onto conveyors and belts. When operated in a working place for purposes other than loading, such equipment will be required to comply with § 75.1719–1(e)(6).

A new paragraph (e)(5) has been added which covers roof-bolting machines separately from other types of equipment. The distance to which a miner is subjected to rib rolls increases as the distance from the floor to the roof increases. It is, therefore, important that illumination be provided on the ribs so that a miner can see a rib roll developing and take evasive action. Illumination will be required of coal surfaces and exposed surfaces of mining equipment which are within a distance of 5 feet from the roof bolting machine or within a distance equal to the distance from the floor to the roof, whichever is greater. It is the intent of the standards that in working places where the distance from the floor to the roof is 5 feet or less, that when the face or a rib is within 5 feet of the machine that such face and ribs shall be illuminated. It is also intended that the roof over the machine and the roof and floor for a distance of 5 feet surrounding the machine shall be illuminated. A distance of 5 feet will be measured, parallel to the floor, from the rear of the machine, from the sides of the machine, and from the sides and front of the drilling boom. The perimeter of the area on the roof and floor which shall be illuminated will be determined by projecting the 5 foot distance to the floor and roof. In addition, any rib surface, face surface, and exposed surface of mining equipment which is within the 5-foot distance shall be illuminated. Where the distance from the floor to the roof is more than 5 feet, the distance from the sides of the machine and the sides and front of the drilling boom will be increased to a distance equal to the distance from the floor to the roof, but the distance from the rear of the machine shall be 5 feet. A roof bolting machine is operated throughout the working place at greater distances from the face and ribs than other self-propelled mining equipment. Further, unlike other self-propelled mining equipment, the roof bolting machine has operating controls located at an operator station at the front of the machine. In view of its unique function, the location of operating controls, and movement throughout the working place, the requirement for illumination only within a distance of 5 feet from the machine or a distance equal to the distance from the floor to the roof, whichever is greater, is provided in order to minimize discomfort glare, the presence of which could result in diminution of safety.

Paragraph (e)(6) will require illumination in working places in which other self-propelled equipment is operated, unless the entire working place is illuminated by stationary lighting. Luminaires shall be installed on each machine which shall illuminate a face or rib coal surface which is within 10 feet from the front and rear of the machine; the area of the surface to be illuminated shall equal the height and width of the machine; and the luminaires in the direction of travel shall be in operation at all times the machine is being trammed in the working place.

Proposed paragraph (f) has been deleted in view of the finding of fact that portable task luminaires or area lighting systems for various nonmachine underground operations require frequent repositioning which in many cases increases the miner's exposure to electrical shock and ignition hazards.

Proposed paragraph (g) required that in anthracite mines the area between the face and the full box, and the battery area at and in by the last open crosscut be illuminated. This requirement has been deleted because in anthracite mines self-propelled mining equipment is not normally used between the face and the full box or in the battery area. However, the provisions of § 75.1719–1 requiring illumination of working places while self-propelled mining equipment is operated in such places will be applied to anthracite mines.

Section 75.1719–1(f): As proposed, paragraph (h) provided that an authorized representative of the Secretary may specify other areas in working places to be illuminated. Proposed paragraph (h) has been redesignated paragraph (f) and has been revised to conform to the findings of fact and to provide that the Assistant Administrator, Coal Mine Health and Safety, MESA, may specify other areas in a working place to be illuminated while self-propelled mining equipment is operated in the working place.

Section 75.1719–1(g): Proposed paragraph (f) of § 75.1719–2 has been redesignated paragraph (g) of § 75.1719–1 and has been modified to clarify those surfaces to be illuminated and the surface brightness of such surfaces.

3. *Section 75.1719–2:* The provisions of § 75.1719–2 have been rearranged for clarity, content of subject matter, and ease of use. Revisions have been made and several new provisions have been added. The rearrangement, revisions and new provisions are described below.

Section 75.1719–2(a): The second sentence of paragraph (a) is redesignated paragraph (c)(1).

Section 75.1719–2(b): A new paragraph (b) has been added to specifically provide for the use of either machine-mounted or stationary lighting fixtures.

Section 75.1719–2(c): The provisions of § 75.1719–2(c) have been rearranged and contain the provisions of the second sentence of proposed § 75.1719–2(a) and revisions of proposed § 75.1719–2(b).

Paragraph (c)(2) contains revisions of the first sentence of proposed paragraph (b) providing more specific approved methods of grounding of stationary light fixtures and a maximum allowable fault current is specified to prevent electrical burns to miners handling energized stationary light fixtures.

Paragraph (c)(3) contains revisions of the second sentence of proposed paragraph (b) which has been modified to require that the frames of machine-mounted light fixtures be grounded to the machine only by a separate grounding conductor in compliance with §75.701–4. This method of grounding is necessary in order to assure an adequate grounding circuit, because light fixtures installed on a machine are occasionally broken loose from the frame of the machine which allows an internal ground fault inside the enclosure to become a shock and/or an ignition hazard.

Section 75.1719–2(d): A new paragraph (d) has been added limiting to 300 volts the amount of voltage that can be used to supply power to stationary light fixtures which can be carried by hand while energized. Extremely dangerous shock hazard exist in handling portable equipment energized at a voltage greater than 300 volts. This hazard is also recognized in 30 CFR Part 18 which limits the voltage of hand-held tools to 300 volts.

Section 75.1719–2(e): Paragraph (e) contains the provisions of proposed paragraph (c) which has been modified to specify a maximum allowable amount of fault current setting which may be used to deenergize the circuit.

Section 75.1719–2(f): Paragraph (f) contains the provisions of proposed paragraph (d). Modifications have been made for clarity and to allow light fixtures to be protected by means other than removal for a specified distance from the blasting operation. This change was made to provide flexibility in the protection of light fixtures without diminution of safety, particularly for longwall operations. For example, the standard as proposed required light fixtures to be removed from the entire longwall face during blasting operations.

Section 75.1719–2(g): Paragraph (g) contains the provisions of the first sentence of proposed paragraph (e). The second sentence of proposed paragraph (e) has been deleted because experiments have shown that a light spread exceeding 170° does not cause glare if the light fixtures are properly oriented. However, paragraph (g) continues the requirement that lighting fixture systems shall be designed and installed to minimize discomfort glare.

4. *Section 75.1719–3:* Proposed § 75.1719–3 has been rearranged, revised and modified as explained below.

Section 75.1719–3(a): Proposed paragraph (a) provided that illumination levels could be determined by measuring surface brightness or incident light. Paragraph (a) has been modified to limit measurement of only luminous intensity (surface brightness). Incident light measurements have been deleted because at the present time technical problems exist in determining the reflectance value of rough and irregular surfaces under actual mining conditions. Paragraph (a) has been further modified to state clearly that the method of

measurement in § 75.1719–3 is intended as prescribing the manner in which luminous intensity measurements will be made by MESA. The requirement that telescopic photosensors or visual photometers be used as instruments to measure light has also been deleted in order to allow for the use of a variety of existing instruments or others which may be developed in the future.

Section 75.1719–3(b): A new paragraph (b) has been added providing for standardization of light measuring procedures from mine to mine depending upon the areas of working places required to be illuminated. Paragraph (b) also combines provisions of proposed paragraphs (c) and (d) with revisions and modifications. The modifications provide for a more practical and enforceable method of light measurement. In addition, for the purpose of clarity, methods of measuring luminous intensity are depicted by figures in paragraphs (b)(5) and (b)(7).

Section 75.1719–3(c): A new paragraph (c) has been added to permit measurements to be made without hazard to an authorized representative of the Secretary under conditions which reflect as near as practicable the conditions surrounding the actual use of a machine. Temporary support may be required but at other times it may be more expedient to move a machine to a similar working place in which permanent roof supports have been installed.

Section 75.1719–3(d): Proposed paragraph (b) has been redesignated paragraph (d). The reference to Figure 4–5 in the "Illuminating Engineering Society Handbook, 4th Ed.," has been changed to the Commission Internationale de l'Eclairage (CIE) Spectral Luminous Curve. The CIE Spectral Luminous Curve is set forth for convenience and ready availability to assist in color correction of the instruments.

5. *Section 75.1719–4:* Paragraph (a) has been modified to provide that the paint on exterior surfaces of mining machines shall have a minimum reflectance of 30 percent, instead of 50 percent, in order to permit the use of common types of readily available protective paints and materials.

Paragraphs (b) and (d) have been modified to specify minimum sizes for reflectors or reflecting tape on mining machines, and reflecting tape, or equivalent paint, or material on hard hats or hard caps.

Test and Evaluation of Illumination Systems

The Mining Enforcement and Safety Administration (MESA) recognizes the complexity of making underground illumination measurements and evaluating illumination systems. Illumination of working places in underground mines is a relatively new and innovative safety measure, although practical lighting fixtures (stationary and machine-mounted) have been developed which will illuminate the working places to 0.06 footlamberts. Such lighting fixtures have been tried under actual mining conditions and at various coal-bed heights and have been found acceptable to both operators and miners. It is also recognized that a scarcity of illumination engineering expertise exists in the coal industry and in the mining equipment and mine lighting fixture industries. Therefore, in order to facilitate design and installation of illumination systems and to expedite compliance with §§ 75.1719 through 75.1719–4 of Part 75, 30 CFR, MESA will provide technical assistance to coal mine operators, mining equipment manufacturers, and lighting fixture manufacturers in their efforts to design and install illumination systems.

The attention of mine operators and equipment manufacturers is directed to a Notice published in Part II of the Federal Register for Thursday, April 1, 1976 (41 FR 14108) which states where and how technical assistance may be obtained from MESA and the test and evaluation of illumination systems. Requests should be made in writing to the Assistant Administrator—Technical Support, MESA, Ballston Towers No. 3, Room 917, 4015 Wilson Boulevard, Arlington, Virginia 22203.

Mine operators, and equipment and lighting fixture manufacturers, are not required to submit lighting systems for test and evaluation. An approval plate or label will not be issued by MESA, nor will such a plate or label be required on lighting systems which have been tested and evaluated. MESA will, however, issue a Statement of Test and Evaluation which will define the parameters within which the illumination system can be operated to provide the required light. For example, the Statement of Test and Evaluation will state the maximum height of the working place, the maximum width of the working place, the type and model of machine (if machine mounted), and location and orientation of light fixtures, and other conditions under which the equipment may be operated to provide the required light.

It is intended that if lighting systems are installed and a machine is operated within the conditions and parameters set forth in the Statement of Test and Evaluation the operator will be considered by MESA as being in compliance with the requirements of the standards. However, if the lighting system is not installed or the machine is not operated within the conditions and parameters stated, light measurements shall be made in accordance with the procedures specified in the regulations to determine whether the required light is provided and whether a violation exists.

Upon written application and payment of fees MESA will test and evaluate lighting systems in a mine or in a simulated working place. Tests may be made on a machine or on a mockup of a machine upon which it is intended to install the lighting system.

In Part II of the Federal Register for Thursday, April 1, 1976, at page 14102 (41 FR 14102) there was published a Notice that on October 1, 1976, the Secretary of the Interior would promulgate by publication in the Federal Register the final standards for the illumination of working places in a coal mine. The form and substance of the standards were set forth, together with the reasons for revisions, modifications, or changes which have been made in the proposed standards. The mandatory standards which are set forth below are those which were published on April 1, 1976, and no further changes or revisions have been made.

Part 75, Title 30, Code of Federal Regulations is amended and revised as set forth below.

Effective Date: These revisions and amendments shall be effective on October 1, 1976.

It is hereby certified that the economic and inflationary impacts of these regulations have been carefully evaluated in accordance with OMB Circular A–107.

Dated: September 23, 1976.

William L. Fisher,
Assistant Secretary of the Interior.

Part 75 of Title 30, Code of Federal Regulation, is amended by revising § 75.–1719 and by adding new §§ 75.1719–1 through 75.1719–4 as follows:

Sec.

75.1719	Illumination; purpose and scope of §§ 75.1719 through 75.1719–4; time for compliance.
75.1719–1	Illumination in working places.
75.1719–2	Lighting fixtures; requirements.
75.1719–3	Methods of measurement; light measuring instruments.
75.1719–4	Mining machines, cap lamps; requirements.

§ 75.1719 Illumination; purpose and scope of §§ 75.1719 through 75.–1719–4; time for compliance.

(a) Section 317(e) of the Act (30 U.S.C. 877(e)) directs and authorizes the Secretary to propose and promulgate standards under which all working places in a mine shall be illuminated by permissible lighting while persons are working in such places. §§ 75.1719 through 75.1719–4 prescribe the requirements for illumination of working places in underground coal mines while persons are working in such places and while self-propelled mining equipment is operated in the working place.

(b) Section 317(e) further provides that all working places in a mine shall be illuminated within eighteen months after the promulgation of the standards. §§ 75.1719 through 75.1719–4 were published and promulgated in the Federal Register on October 1, 1976 (41 FR 43534). Mine operators shall comply with §§ 75.1719 through 75.1719–4 not later than April 1, 1978.

§ 75.1719–1 Illumination in working places.

(a) Each operator of an underground coal mine shall provide each working place in the mine with lighting as prescribed in §§ 75.1179–1 and 75.1719–2 while self-propelled mining equipment is operated in the working place.

(b) *Self-propelled mining equipment; definition.* For the purposes of §§ 75.1719 through 75.1719–4, "self-propelled mining equipment" means equipment which

possesses the capability of moving itself or its associated components from one location to another by electric, hydraulic, pneumatic, or mechanical power supplied by a source located on the machine or transmitted to the machine by cables, ropes, or chains.

(c) The lighting prescribed in this section shall be in addition to that provided by personal cap lamps.

(d) The luminous intensity (surface brightness) of surfaces that are in a miner's normal field of vision of areas in working places that are required to be lighted shall be not less than 0.06 footlamberts when measured in accordance with § 75.1719–3.

(e) When self-propelled mining equipment specified in paragraphs (e)(1) through (e)(6) of this section is operated in a working place, the areas within a miner's normal field of vision which shall be illuminated in the working place shall be as prescribed in paragraphs (e)(1) through (e)(6) of this section.

(1) *Continuous miners and coal-loading equipment.* In working places in which continuous miners and coal-loading equipment are operated, the areas which shall be illuminated shall be as follows:

(i) The face, and

(ii) The ribs, roof, floor, and exposed surface of mining equipment, which are between the face and the inby end of the shuttle car or other conveying equipment while in position to receive material.

(2) *Self-loading haulage equipment used as a loading machine.* In working places in which self-loading haulage equipment is operated to load material, the areas which shall be illuminated shall be as follows:

(i) The face, and

(ii) The ribs, roof, floor, and exposed surfaces of mining equipment, which are between the face and a point 5 feet outby the machine.

(3) *Cutting and drilling equipment.* In working places in which cutting or drilling equipment is operated, the areas which shall be illuminated shall be as follows:

(i) The face, and

(ii) The ribs, roof, floor, and exposed surfaces of mining equipment, which are between the face and a point 5 feet outby the machine.

(4) *Shortwall and longwall mining equipment.* In working places in which shortwall or longwall mining equipment is operated, the areas which shall be illuminated shall be as follows:

(i) The area for the length of the self-advancing roof support system and which is between the gob-side of the travelway and the side of the block of coal from which coal is being extracted, and

(ii) The control station, and the head piece and tail piece of the face conveyor, and

(iii) The roof and floor for a distance of 5 feet horizontally from the control station, head piece and tail piece.

(5) *Roof bolting equipment.* In working places in which roof bolting equipment is operated, the areas which shall be illuminated shall be as follows:

(i) *Where the distance from the floor, to the roof is 5 feet, or less:* the face, ribs, roof, floor, and exposed surfaces of mining equipment, which are within an area the perimeter of which is a distance of 5 feet from the machine, when measured parallel to the floor.

(ii) *Where the distance from the floor to the roof is more than 5 feet:* the face, ribs, roof, floor, and exposed surfaces of mining equipment, which are within an area the perimeter of which from the front and sides of the machine is a distance equal to the distance from the floor to the roof and from the rear of the machine a distance of 5 feet, when measured parallel to the floor.

(6) *Other self-propelled equipment.* Unless the entire working place is illuminated by stationary lighting equipment, in working places in which self-propelled equipment is operated, other than equipment specified in paragraphs (e)(1) through (e)(5) of this section, illumination shall be provided as follows:

(i) Luminaires shall be installed on each machine operated in the working place which shall illuminate a face or rib coal surface which is within 10 feet of the front and the rear of the machine to a luminous intensity of not less than 0.06 footlamberts, and

(ii) The height and width of the area of the coal surface which shall be illuminated shall equal the height and width, respectively, of the machine on which the luminaires are installed, and

(iii) The luminaires in the direction of travel shall be operated at all times the equipment is being trammed in the working place.

(f) The Assistant Administrator, Coal Mine Health and Safety, MESA, may specify other areas in a working place to be illuminated for the protection of miners while self-propelled mining equipment is being operated in the working place.

(g) Surface brightness of floor, roof, coal and machine surfaces in the normal visual field of a miner shall not vary more than 50 percent between adjacent fields of similar surface reflectance, and the maximum surface brightness of such surface shall not exceed 120 footlamberts, when measured in accordance with § 75.1719–3.

§ 75.1719–2 Lighting fixtures; requirements.

(a) Lighting fixtures shall be permissible.

(b) Lighting fixtures may be installed on self-propelled machines or may be stationary lighting fixtures.

(c)(1) Electrically operated lighting fixtures shall be energized by direct current, or by sinusoidal full wave alternating current not less than 50 cycles per second (100 pulses per second), or by an equivalent power source that causes no greater flicker.

(2) Alternating current circuits supplying power to stationary lighting fixtures shall contain conductors energized at voltages not greater than 70 volts to ground. Alternating current circuits, energized at 100 volts or more and used to supply power to stationary lighting fixtures, shall originate at a transformer having a center or neutral tap grounded to earth through a proper resistor, which shall be designed to limit fault current to not more than 5 amperes. A grounding circuit in accordance with § 75.701–4 shall originate at the grounded terminal of the grounding resistor and extend along with the power conductors and serve as a grounding conductor for the frames of all equipment receiving power from the circuit. The ground fault current rating of grounding resistors shall meet the "extended time rating" set forth in the Institute of Electrical and Electronics Engineers, Inc. Standard No. 32 (IEEE Std. 32–1972) which is hereby incorporated by reference and made a part hereof. The incorporated publication is available for examination at each Coal Mine Health and Safety District and Subdistrict Office of MESA, and may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, N.Y. 10017.

(3) Machine-mounted lighting fixtures shall be electrically grounded to the machine by a separate grounding conductor in compliance with § 75.701–4.

(d) Direct current circuits in excess of a nominal voltage of 300 volts shall not be used to supply power to stationary light fixtures.

(e) Cables conducting power to stationary lighting fixtures from both alternating and direct current power sources, other than intrinsically safe devices, shall be considered trailing cables, and shall meet the requirements of Subpart G of this part. In addition, such cables shall be protected against overloads and short circuits by a suitable circuit breaker or other device approved by the Secretary. Circuit breakers or other device approved by the Secretary protecting trailing cables receiving power from resistance grounded circuits shall be equipped with a ground trip arrangement which shall be designed to deenergize the circuit at not more than 50% of the available fault current.

(f) Before shunts are removed from blasting caps, lighting fixtures and associated cables located in the same working place shall be deenergized. Furthermore, lighting fixtures shall be removed out of the line of blast and not less than 50 feet from the blasting operation unless otherwise protected against flying debris.

(g) Lighting fixtures shall be designed and installed to minimize discomfort glare.

§ 75.1719–3 Methods of measurement; light measuring instruments.

(a) Compliance with § 75.1719–1(d) shall be determined by MESA by measuring luminous intensity (surface brightness).

(b) In measuring luminous intensity the following procedures shall be used:

(1) In areas of working places specified in §§ 75.1719.1(e)(1) through 75.-1719–1(e)(3) luminous intensity measurements of the face, ribs, roof, floor, and exposed surfaces of mining equipment, shall be made with the machine idle and located in the approximate center of the working place with the cutting,

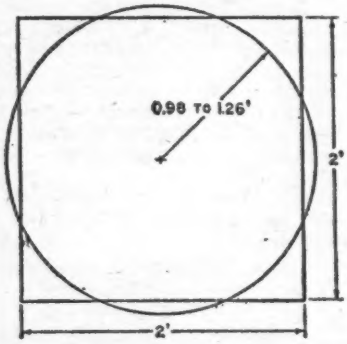
loading, or drilling head toward the face and not more than 3 feet from the face.

(2) In areas of working places specified in § 75.1719–1(e)(4) luminous intensity measurements may be made at any time longwall or shortwall mining equipment is operated except that when measurements are made in the vicinity of shearers, plows, or continuous miners, the equipment shall be idle while measurements are being made.

(3) In areas of working places specified in § 75.1719–1(e)(5) luminous intensity measurements of the face, ribs, roof, floor, and exposed surfaces of mining equipment, shall be made with the machine idle and located in the approximate center of the working place with the drilling head toward the face and a distance from the face of 5 feet, or the distance from the floor to the roof, whichever is applicable. When the machine is located in the center of the working place and the surfaces of the ribs to be illuminated are not within the perimeter of the area determined in accordance with § 75.1719–1(e)(5), the machine shall be positioned the applicable distance from the face and each rib and luminous intensity measurements made for each rib, provided, however, that luminous intensity measurements may be made of the face, roof, floor, and exposed surfaces of mining equipment with the machine so located without locating the machine in the center of the working place.

(4) In areas of working places specified in § 75.1719–1(e)(6), luminous intensity measurements of a coal surface shall be made with the machine idle and located in the approximate center of the working place with the appropriate end toward the face and not less than 9 feet nor more than 10 feet from the face.

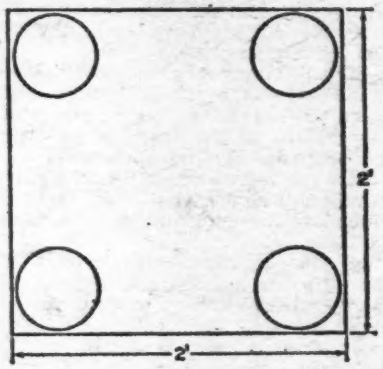
(5) The area of surfaces to be measured shall be divided into round or square fields having an area of not less than 3 nor more than 5 square feet as illustrated by the following figure:



DIRECT MEASUREMENT OF LUMINOUS INTENSITY

(6) Measurements shall be taken with the photometer held approximately perpendicular to the surface being measured and a sufficient distance from the surface to allow the light sensing element in the instrument to receive reflected light from a field of not less than 3 nor more than 5 square feet. The luminous intensity of each such field shall be not less than 0.06 footlambert.

(7) In areas of working places where clearances are restricted to the extent that the photometer cannot be held a sufficient distance from the surface to allow the light sensing element in the instrument to receive reflected light from a field having an area of at least 3 square feet, luminous intensity shall be considered as the average of four uniformly spaced readings taken at the corners and within a square field having an area of approximately 4 square feet. In such instances, the area of each of the individual readings shall not exceed 100 square inches. The average of the four readings shall be not less than 0.06 footlambert. The method of measurement is illustrated by the following figure:



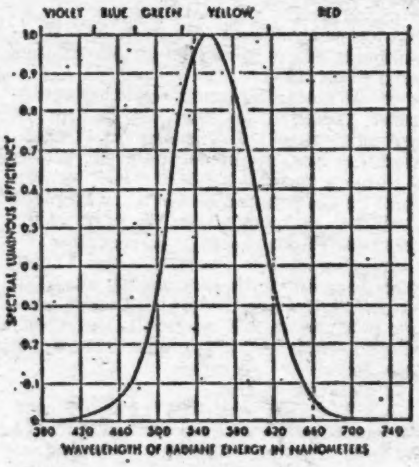
DETERMINATION OF LUMINOUS INTENSITY BY AVERAGING METHOD

(8) Measurements shall not be made where shadows are cast by roof control posts, ventilation equipment, or other obstructions necessary to insure safe mining conditions.

(9) Where machine-mounted light fixtures are used on equipment, except self advancing roof support systems, measurements shall not be made of surfaces on or within 1 foot of a self-propelled machine.

(c) For the purpose of making illumination measurements, an authorized representative of the Secretary may require the installation of temporary roof supports or the removal of the equipment to a similar working place in which permanent roof supports have been installed.

(d) Light measuring instruments shall be properly calibrated and maintained. Instruments shall be calibrated against standards traceable to the National Bureau of Standards and color corrected to the Commission Internationale de l'Eclairage (CIE) Spectral Luminous Curve. The CIE Spectral Luminous Curve is as follows:



§ 75.1719–4 Mining machines, cap lamps; requirements.

(a) Paint used on exterior surfaces of mining machines shall have a minimum reflectance of 30 percent, except cab interiors and other surfaces which might adversely affect visibility.

(b) When stationary light fixtures are used, red reflectors mounted in protective frames or reflecting tape shall be installed on each end of mining machines, except that continuous mining machines, loaders, and cutters need only have such reflectors or tape on the outby end. Reflectors or reflecting tape shall have an area of not less than 10 square inches.

(c) Each person who goes underground shall be required to wear an approved personal cap lamp or an equivalent portable light.

(d) Each person who goes underground shall be required to wear a hard hat or hard cap which shall have a minimum of 6 square inches of reflecting tape or equivalent paint or material on each side and back.

(Secs. 101, 317(e) Pub. L. 91–173, 83 Stat. 745, 788 (30 U.S.C. 811, 877(e)))

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